News Releases

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NEWS RELEASE

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Manure Management Reduces Levels of Antibiotics and Antibiotic Resistance Genes

Researchers investigate the role of animal waste in spreading antibiotics and antibiotic resistance genes in the November-December issue of Journal of Environmental Quality.

MADISON, WI, NOVEMBER 26, 2007-- Antibiotic resistance is a growing human health concern. Researchers around the globe have found antibiotics and other pharmaceuticals to be present in surface waters and sediments, municipal wastewater, animal manure lagoons, and underlying groundwater. In a recent article in the November-December issue of *Journal of Environmental Quality*, researchers at Colorado State University (CSU) describe a study to find out if animal waste contributes to the spread of antibiotics and antibiotic resistance genes (ARG), and if they can be reduced by appropriate manure management practices.

In the study, funded by the USDA Agricultural Experiment Station at CSU and the National Science Foundation (NSF), researchers investigated the effects of manure management on the levels of antibiotics and ARG in manures. The study was conducted at two scales. In the pilot-scale experiment, horse manure was spiked with the antibiotics chlortetracycline, tylosin, and monensin and compared to horse manure that was not spiked with antibiotics to determine the response of ARG in unacclimated manures. In the large-scale experiment, dairy manure and beef feedlot manure, which were already acclimated to antibiotics, were monitored over time.

The manures were subjected to high-intensity management (HIM-amending with leaves and alfalfa, watering, and turning) and low-intensity management (LIM-no amending, watering, and turning) for six months. During this time, the levels of antibiotics were monitored using high-performance liquid chromatography (HPLC) and tandem mass spectrometry (MS/MS). In addition, two types of ARG that confer resistance to tetracycline, tet(W) and tet(O), were monitored using quantitative polymerase chain reaction (Q-PCR).

In the pilot study, chlortetracycline, tylosin, and monensin all dissipated more rapidly in the HIM-manure than in the LIM-manure. In the large-scale study, feedlot manure initially had higher concentrations of the several tetracycline antibiotics than the dairy manure. After four months of treatment, tet(W) and tet(O) decreased significantly in dairy manure, but two more months of treatment were necessary for similar reductions of ARG in the feedlot manures.

The results showed that HIM was more effective than LIM at increasing the rate of antibiotic dissipation, but it was not a significant factor in reducing the levels of ARG. The length of treatment time was the main factor in reducing the levels of both antibiotics and ARG. For manures with initially high levels of antibiotics, treatment times of at least six months may be necessary for a significant reduction in levels of antibiotics and ARG. The results also provided evidence that ARG may be present for extended time periods even after antibiotics have fully dissipated.

Scientists at Colorado State University are continuing research in this area by examining full-scale local on-farm waste management practices. Together this research will lead to a better understanding of possible ARG mitigation strategies so that best management practices can be developed to reduce the effects that animal waste may have on the spread of ARG.

The full article is available for no charge for 30 days following the date of this summary. View the abstract at http://jeq.scijournals.org/cgi/content/abstract/36/6/1695.

The Journal of Environmental Quality, http://jeq.scijournals.org is a peer-reviewed, international journal of environmental quality in natural and agricultural ecosystems published six times a year by the American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and the Soil Science Society of America (SSSA). The Journal of Environmental Quality covers various aspects of anthropogenic impacts on the environment, including terrestrial, atmospheric, and aquatic systems.

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